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CONTRIBUTIONS TO THE MAMMALOGY OF FLORIDA.

BY SAMUEL N. RHOADS.

During the past two years the writer has received from Mr. W. S. Dickinson, of Tarpon Springs, Hillsborough Co., Florida, a considerable series of the mammals inhabiting that vicinity. A recent study of these has developed facts of sufficient interest to warrant publication.

Tarpon Springs lies within a few miles of the Gulf of Mexico, near the Anclote River, in a region typical of a large part of the southern half of the State. The country is level, very sandy, well shaded with lakes and "hammocks" and, owing to its proximity to the Gulf, combines inland and maritime zoological features within a comparatively small compass. The region in question lies just to the north of Tampa Bay, which may be said to define the northern extension of the typically Floridian fauna along the Gulf Coast. The following notes would seem to confirm the intermediate faunal position of Tarpon Springs between a Louisianian and Floridian environment. There is, however, an indication of geographic variation from forms typical of northern and eastern parts of the State, which shows a closer alliance among the mammals of Tarpon Springs with those of the more southern districts.

The only important faunal paper specially relating to the mammalogy of Florida is that of Dr. J. A. Allen in the Bulletin of the Museum of Comparative Zoology, Vol. II, p. 168-185.

I follow Dr. Allen's sequence of orders, genera and species.

1. **Putorius peninsulae** Rhoads, sp. nov. Type, No. 1515, ad. ♀, col. of S. N. Rhoads; "Hudson's," Pasco Co., Florida; col. by W. S. Dickinson, Feb. 1894.

Description.—Size greater than average *P. erminea* from the Middle States; relative breadth of coloration of lower and upper parts as in *P. frenatus*; color pattern of feet, legs and face nearest *P. xanthogenys*; pilosity of foot-pads and ears nearest to *P. frenatus*; colors and length of tail and whiskers as in *P. erminea*; pelage scant, coarse and shorter than in any weasel examined; skull nearest *P. erminea*, but differing more markedly from either than *P. erminea* from *P. xanthogenys*.

Above, including tail, top of head, upper arm and hind thighs to middle of feet, light liver-brown of nearly the same shade as seen in fall specimens of *erminea* from Pennsylvania. Below, including inside of hind legs, distal half of hind feet, posterior two-thirds of forelegs, and all of forefeet, pale yellowish white. Muzzle, below margins of upper lips, an irregular patch above, but not reaching nose, an irregular streak half-way between nose and eyes and reaching behind anterior corner of eye, an ascending streak broadly rising on cheek and narrowing forward to just over eyes and not connecting with nose patch, also a short median streak between ears, pure white. A sparse patch of long bristling white hairs guards the opening of the ear. Two-thirds of the tail colored like the back, distal third, black. Tail two-fifths of length of body, very slender, sparsely haired, the terminal pencil short.

Skull.—(Post-palatal and post-frontal regions missing) intermediate in general configuration between *frenatus* and *xanthogenys*; in size very near the latter. Mandibles very massive and short; dentition also massive and crowded. The sudden post-orbital expansion of anterior portion of brain-case indicates that part to be relatively larger and more inflated than in any other of our weasels, resembling most in this character, *erminea*. Inner lobe of last upper molar slightly narrower transversely than outer lobe, the tooth standing at an oblique angle to the longitudinal diameter of the skull; in all the allied forms these proportions are reversed and the last molar is at right angles to this diameter. In *xanthogenys* the inner lobe is often twice the diameter of the outer lobe. In *peninsulae* the longest diameter of the first upper molar is at an angle of 45° with that of the second molar and at right angles with that of the premolar; in the other species the first and second molar diameters are generally in the same line, never departing from it more than 15° and this diameter of the premolar is never deflected from that of first molar more than 20° in *frenatus* and *erminea*, nor more than 45° in *xanthogenys*.

While the skull of *peninsulae* is one-third smaller than that of *frenatus* of same age, the upper first and second molars are as large as those of largest *frenatus* and absolutely stouter. Upper and lower canines short and stout, the lower so massive basally as to crowd the incisors into a double row, the second incisor of each mandible being forced back of the other four, which form a solid anterior row unbroken by the usual crowding forward of the second incisor be-

tween the first and third, seen in all other species of the *Muselidæ*. There is no symphysis between lower canines and first premolars, the latter over-lying the former in *peninsulæ* and the second lower molar is relatively as large as in the upper series. Viewed laterally, the mandibles of *peninsulæ* describe a nearly perfect half ring due to the great outer convexity of the ramus, its rounded, compressed angle and abrupt upward anterior curve. The ramus is also very thick (laterally) for its width (perpendicularly), the former dimension at the base of second molar is greater than that of largest *frenatus* while the latter dimension is one-third less. In *peninsulæ* the width (horizontal) of the articular process of mandible is relatively much less than we find it in *frenatus* and *xanthogenys*, in this approaching *erminea*, but it is, as in other parts, relatively stouter than in any of them.

*Measurements*¹ (from stuffed skin):—Total length, 375; tail vertebræ (vertebræ remaining in skin), 100; hind foot, 40; pencil, 16.

Skull—Posterior base of incisors to post-palatal notch, 18.7; length of nasals, 9; interorbital constriction, 10.7; articular process of mandible to anterior base of incisor, 26; height of coronoid process from angle, 12.

My examination of the skulls of the above mentioned species makes it apparent, not only that the Florida animal is distinct from its allies in the United States, but that *xanthogenys* should be classed as a good species, separable from *frenatus* not only in external but in cranial characters. The relationships between *frenatus* and *brasiliensis*, of which some authors make it a sub-species, I am unable to discuss, from lack of material. *Xanthogenys*, in addition to its constant and well known color differences, may be cranially separated from *frenatus* of same age by the decidedly and constantly smaller size, the relative shallowness and flatness, the greater relative width to length and the sudden constriction of the skull behind the supra-orbital processes. The pterygoid fossa is also relatively shorter and both absolutely and relatively wider than in *frenatus*. The length of largest *frenatus* skulls is 54, while that of the largest *xanthogenys* is 46.

A stuffed specimen of this new weasel was sent by Mr. Dickinson in February, 1894. So far as can be determined, this is the first instance

¹ All measurements in millimeters.

on record of such an animal from Florida. Fortunately, the anterior half of the skull, including the perfect jaws, were within and attached to the skin. These were extracted and confirmed my suspicions, excited by the peculiar external characters, that the animal was a nondescript. As will be seen in the diagnosis, it combines the characteristic color-pattern of the *P. brasiliensis* group with the colors and relative measurements of the *erminea* group. This weasel was captured in the woods by a cat, in Pasco County, Florida, at "Hudson's," 14 miles north of Tarpon Springs.

2. *Lutra hudsonica* (Lacepede). American Otter.

The otter is abundant. Quite a number of their skins and furs have been sent. The latter, large and prime, bring little over five dollars in the Philadelphia market, owing to the scant pelage. The average color is even darker and more glossy than in the highly prized pelts from the northwestern States.

3. *Procyon lotor* (Linn.). Raccoon.

A large series of furs, skins and skulls of this abundant animal have passed through my hands. They show the Florida coon to be when young, almost exactly the same color as average adults from the Middle States. As they increase in age a strong suffusion of orange brown becomes pronounced on the back, rump and tail.

In Dr. Allen's paper (*sup. cit.*, p. 170) *P. hernandezii* is made a synonym of *lotor*. An exceptionally large series of skulls from Florida, the Middle States and the Northwest shows the following specific differences, based on six typical adult specimens of each series.

	<i>P. lotor.</i>	<i>P. hernandezii.</i>
1. Zygomatic width,	63 to 72	74 to 79
2. Basilar length,	98 " 104	96 " 104
3. Inter-orbital constriction,	26 " 30	20 " 24
4. Ratio of first meas. to second,	68	77·4
5. Ratio of third meas. to second,	22	28

In *hernandezii* there is no ridged occipital crest, generally present in older examples of *lotor*; the mandibles are heavier and stouter, more widely separated to accommodate the great width of brain case, and broader between the canines; in length they are the same as in *lotor*. The angle is more produced, narrow and angular in *hernandezii*, the upper molar series very wide for their length and decidedly

triangular, in *lotor* the molars are quite symmetrically rounded. The premolars in the former are large, strongly rooted and always present, in *lotor* they are relatively smaller and the first premolar often crowded out. Auditory meatus of *hernandezii* produced like the neck of a flask, making transverse diameter of bullæ much greater than the longitudinal, in *lotor* these diameters are equal. In *lotor* the median attenuation of the zygomatic arch is decided, narrow and semi-cylindrical; in *hernandezii* it is slight, the malar being broad and strap-like. A strong and constant difference between Pacific and Atlantic Coast specimens is the much greater relative size of the brain and brain-case in the former, especially in the anterior breadth and greater depth. This feature causes a specific difference in the upper cranial profile; in *hernandezii* there is a gentle continuous rise from nasals to the fronto-parietal suture or even farther back, in *lotor* this ascent is more abrupt to the interorbital region, which is tumid, followed by a depression and rising again, giving the skull an undulating profile.

The characters given by Prof. Cope (Amer. Nat., Feb., 1889, pp. 141-142), as distinguishing *lotor* from *hernandezii* I do not find of as constant value as those above given, except those relating to the latter species near the bottom of page 142, notably the greater prominence of the post-orbital processes of the malar and frontal bones.

4. ?*Atalapha borealis* ² *pfeifferi* (Gundlach). Florida Red Bat.

All the specimens of this bat sent from Tarpon Springs, as well as those which I have examined from other parts of the State, are uniformly of the "deep cherry red" spoken of by Dr. J. A. Allen (*sup. cit.*, p. 173). Dr. Harrison Allen (Mon. Bats. N. Amer., 1893, p. 146) notices the same peculiarity and refers them questionably to *A. pfeifferi* Gundlach, (Monatsb. K. B. Akad., Berlin., 1861, p. 152).

Dr. Gundlach's description, which is full, seems to answer for this form very well, except that he states the roots of the hairs are gray, whereas in Florida specimens the roots are black. The color of *pfeifferi* is said to be cinnamon red in the male and cinnamon brown in the female. I have been unable to secure specimens of the Cuban form for comparison, so refer the Floridian variety to it for the pres-

²*Vespertilio borealis* Müller, Natursyst., Suppl., 1776, p. 20, antedates *V. noboracensis* Erxl., Syst. Reg. Anim., 1777, p. 155.

ent. The range of color variability of the Red Bat of the Carolinian fauna never approaches the character of that seen in all my specimens from Tarpon Springs. They fully deserve sub-specific recognition, not only on account of their decided differences, but because of their constancy.

5. **Adelonycteris fuscous*** (Beauv.) H. Allen. Brown Bat.

Numerous specimens received.

6. **Vesperugo carolinensis*** (Geoff.). Georgia (Carolina) Bat.

Two specimens.

7. **Nyctoejus humeralis*** Raf. Rafinesque's Bat.

Three (?) specimens.

8. **Vesperilio gryphus*** F. Cuv. Little Brown Bat.

Several specimens.

9. **Nyctinomus brasiliensis** Is. Geoff. Brazilian Bat.

Very abundant.

10. **Scalops parvus** Rhoads, sp. nov. Type No. 1468, ad. ♀; col. S. N. Rhoads, Tarpon Springs, Fla., Dec. 24, 1893, col. by W. S. Dickinson.

Description.—Size two-thirds that of *Scalops aquaticus*; pelage much coarser, having the appearance of spun glass; the terminal fourth of hairs silvery brown, basal three-fourths plumbeous; chest, wrists, muzzle and upper head orange brown, darkening posteriorly, golden anteriorly. Feet and tail coarsely haired, not downy as in *aquaticus*. Palms wider than long, the contour of nails evenly rounded both individually and collectively, not triangular as in *aquaticus*. Naked snout unusually long and slender, not divided at its inferior base by the "hare-lip" incision seen in *aquaticus*.

Skull.—On superficial examination, similar to *aquaticus*. Relative depth greater. Orbita relatively larger. Foramen magnum, viewed posteriorly, ovate, regular, lacking tricrenate anterior outline always present in adult *aquaticus*. In *parvus* there is a post-palatal spur not present in any specimens of *aquaticus* I have seen. The cranium viewed laterally shows an evenly ascending and more highly arched profile descending behind much more abruptly than in *aquaticus*, in

* For synonymy of these bats, see Dr. H. Allen's Bats N. Amer., 1893.

which the profile is interrupted by interorbital and parietal swellings. In *aquaticus* the last three molars average as wide as long, in *parvus* much wider than long, owing to the greater relative intrusion of their inner anterior cusps. In *aquaticus* the first premolar, owing to sudden constriction of the rostrum at that point, is thrown within the line connecting the canine and second premolar; in *parvus* these three teeth are in regular file. Mandibular dentition in *parvus* relatively wider for length throughout, and the outline of teeth more angular than in *aquaticus*; the hinder section of last molar in *parvus* is less than half the width of anterior section; in *aquaticus* the sections of this tooth are of equal width and its greatest length exceeds considerably its greatest width, while in *parvus* the transverse diameter equals the longitudinal. In the latter the mandibular ramus, as in the case of *Putorius peninsulae*, while much shorter, is absolutely heavier and wider.

There is a strong projecting shoulder at the anterior base of coronoid process in *parvus* not seen in *aquaticus*, and the accessory posterior spur just below tip of coronoid process in the latter is not present in the former. The measurements are as follows:—

BODY.	Total length.	Tail.	Hind foot.	Snout (tip to angle of lip).	
<i>Scalops aquaticus</i> ,	155	24	20	7·5	
" " <i>australis</i> ,	"142	21·5	16·5 "	?	
" <i>parvus</i> ,	117	151	6·5	7·5	
SKULL.	Total length.	Basil. length.	Mast. breadth.	Int. con.	Mand. length.
<i>Scalops aquaticus</i> ,	34·5	27·1	18	8	22
" " <i>australis</i> ,	?	"28·5	15·7	7"	?
" <i>parvus</i> ,	29·5	"23·4	15 "	6·3	19

One specimen of this genus has been received from Mr. Dickinson. It is an adult, with teeth well worn, showing well marked specific characters to distinguish it from *S. aquaticus* and its closely allied forms, *argentatus* and *australis*.³

11. *Sciurus niger* Linn. Southern Fox Squirrel.

All of the thirteen specimens received are remarkably uniform in color for so variable a species, being of the light gray type, with black crown, white ears and nose patch and tawny underparts. One short tailed specimen is blacker on feet and legs, the belly rusty.

³ *Scalops aquaticus australis* Chapman, Bull. Amer. Mus. N. H., 1893 Art. XXI.

12. *Sciurus carolinensis* Gmel. Gray Squirrel.

Abundant and presenting but slight variability. No melanistic examples reported.

13. *Sciuropterus volucella* (Pallas). Flying Squirrel.

Five specimens of this species are of special interest as they appear to be the first to go on record from Florida. They present no characters in either old or young which are not nearly duplicated by specimens from the Middle States.

14. *Geomys tuza* Ord. Florida Gopher.

Thirty specimens of all ages do not present the plumbeous color variations so strongly marked in *G. bursarius* (Shaw). They are not as variable as a like series of *Sitomys americanus*, such differences as appear being due to ordinary results of age and season. One very large, old male is uniform bright rusty above and hoary fulvous beneath. The rest are darker, the rusty mainly confined to sides, with a duskier dorsal stripe and hoary plumbeous belly. The naked yellowish tail invariably has a mahogany-colored tip and averages half the length of head and body. Some females, apparently only half grown, were nursing young.

15. *Mus decumanus* Pallas. Norway Rat.**16. *Mus alexandrinus* Geoff.** Roof Rat.**17. *Mus musculus* Linn.** House Mouse.

With exception of the Norway Rat these old-world species are very abundant.

18. *Sitomys americanus gossypinus* (Le Conte). Pine-woods Deer Mouse.

A series of thirty Tarpon Springs specimens show no mentionable differences from those of northern Florida. Two skins have a prevailing dark sooty suffusion of the under parts which at first sight would indicate a specific difference, but it is probably due to their residence in a recently burnt clearing. In young specimens the gray is more hoary above than in typical *americanus* and the underparts are more plumbeous, lacking almost entirely the pure white of lower head and neck seen in young *americanus*.

19. *Sitomys niveiventris subgriseus* (?) Chapman. Pigmy Deer Mouse.

⁴Bull. Am. Mus. N. Hist., II, 1889, 117; ibid, 1893, Art. XX

Specimens of a small white-footed mouse, which are at present referred provisionally to this race, were received from Tarpon Springs a few days before the issue of Mr. Chapman's paper on *subgriseus*. These were sent to Mr. Chapman for comparison and he pronounced them intermediate between *niveiventris* and *subgriseus*. Additional specimens, making in all seventeen, have since been received. A comparison of these with Mr. Chapman's rather brief diagnosis shows them to differ from *niveiventris* in their smaller size; from *subgriseus* in the uniform whiteness of the belly hairs to their roots, and from both forms in their uni-colored and nearly naked tails, which strikingly resemble those of *Geomys tuza*. Owing to my inability to secure a loan of the type series in the possession of the American Museum, a critical comparison of these differences cannot now be made. They appear, however, to represent at least a sub-specific variation, and a study of the cranial measurements strongly supports this view.

Mr. Dickinson writes me that these mice "were taken in a cultivated field near the head of Anclote River, in Pasco County. They make a burrow from two to three feet long and ten to eighteen inches deep, at the bottom of which is found the nest. They also have a second passage through which to escape from their enemies in case of pursuit; the outlet of this is hidden, apparently lacking three-quarters of an inch of penetrating the surface of the ground. When a switch is inserted they push through this secret outlet and often escape. In captivity they are cannibals."

20. *Oryzomys palustris natator* Chapman. Florida Rice-field Mouse.

One specimen sent. A series of this form from the Gulf Coast would be of interest to compare with those of northern Florida and Texas, but I have been unable to secure them.

21. *Sigmodon hispidus littoralis*⁵ (?) Chapman. Florida Cotton Rat.

Of the five specimens of Cotton Rat (three adults, two young) sent from Tarpon Springs, two very old individuals are strikingly different from typical *hispidus* and are evidently similar to the "No. 1,460" from Pine Island, mentioned by Mr. Chapman in his description of *littoralis* as being much grayer than the Gainesville

⁵Bull. Amer. Mus. N. Hist., II, June, 1889, "Art X.

specimens. They are also grayer than specimens from Indian River loaned me by Mr. G. S. Miller, Jr. They are likewise much larger, as the following table of measurements will show:

BODY.	Total length.	Tail.	Hind foot.	
<i>Sigmodon hispidus</i> ,	262	100	30	
" " <i>littoralis</i> ,	275	104	31	
" " <i>subsp?</i>	288	111	31	
SKULL.	Total length.	Zyg. width.	Int. const.	Length nasal.
<i>Sigmodon hispidus</i> ,	35·9	20·3	5·3	14·3
" " <i>littoralis</i> ,	35·5	20·3	5·4	13·2
" " <i>subsp?</i>	38·5	20·8	5·2	15

In *hispidus* the ratio of total length to zygomatic width is 56·5 in *littoralis* 57·2, in the Tarpon Springs specimens 51·4.

A later specimen from Mr. Dickinson is very similar in every feature to typical *hispidus* from North Carolina, being browner than typical *littoralis* and quite as small, though nearly adult. The receipt of this specimen has induced me to defer separating the southwestern form until a large series is at my disposal from this region. These two gray Cotton Rats from Tarpon Springs are either abnormally large and the small one abnormally brown, or else there are two species, the smaller, true *hispidus*, the larger, unnamed. Such a condition of affairs is not impossible, the former being an inhabitant of the inland fresh water marshes, the latter frequenting the maritime shores.

22. *Reithrodontomys humilis* (subsp?) Aud. & Bach. Harvest Mouse.

One specimen received. I do not find any record of this mouse from Florida. The specimen, if characteristic of the form inhabiting southern Florida, represents a race as different from the northern type as other of the Florida Muridae.

The specimen, while apparently full grown, is not fully adult and, in the hope of securing more specimens, further description is now deferred.